SPHENIX Clusterizer Overview

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26 July 2016

The Island Algorithm at CMS

Procedure:

1. Store “seed” towers. Defined by $E_T > E_T^{thresh}$
2. Remove seeds adjacent to higher energy ones.
3. Starting from highest energy seed:
    a. Move both directions in φ until rise in energy or hole.
    b. Move one step in η. Repeat φ search.
        i. Continue along η until energy rise or hole.

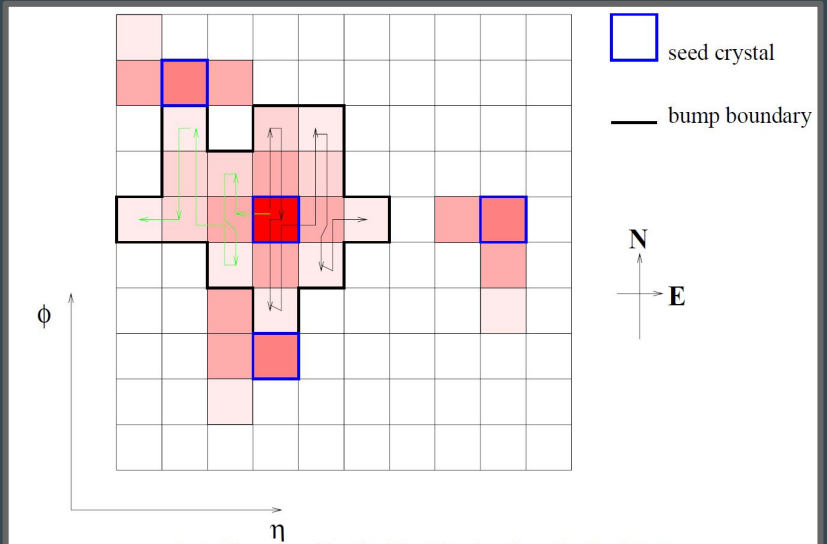
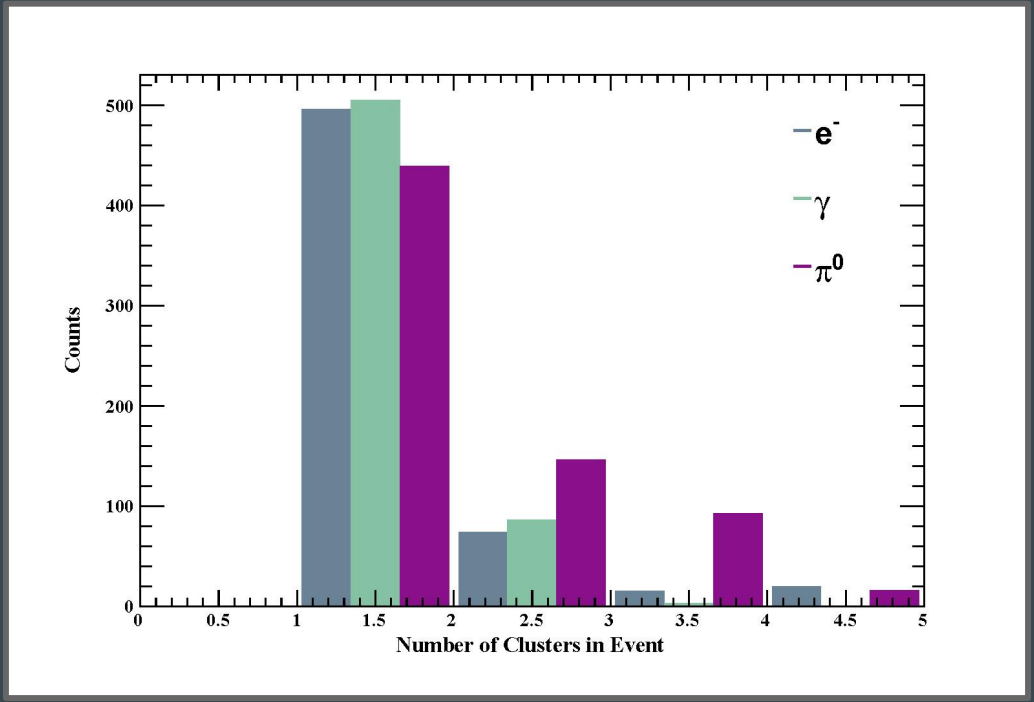


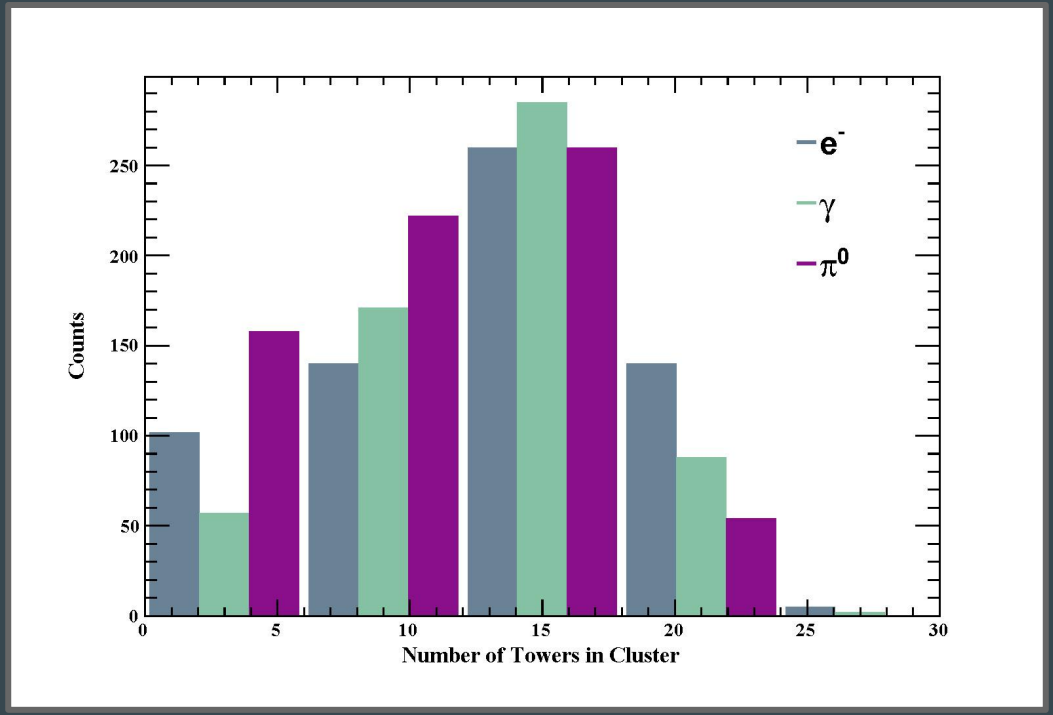
Fig. 1: Illustration of the Island clustering algorithm in the Barrel ECAL

Simple Checks: Number of Clusters Per Event



- Single-particle [$(\eta, \varphi) = (0, 0)$] events.
- Varied (but known) particle p_T

Simple Checks: Number of Towers Per Cluster



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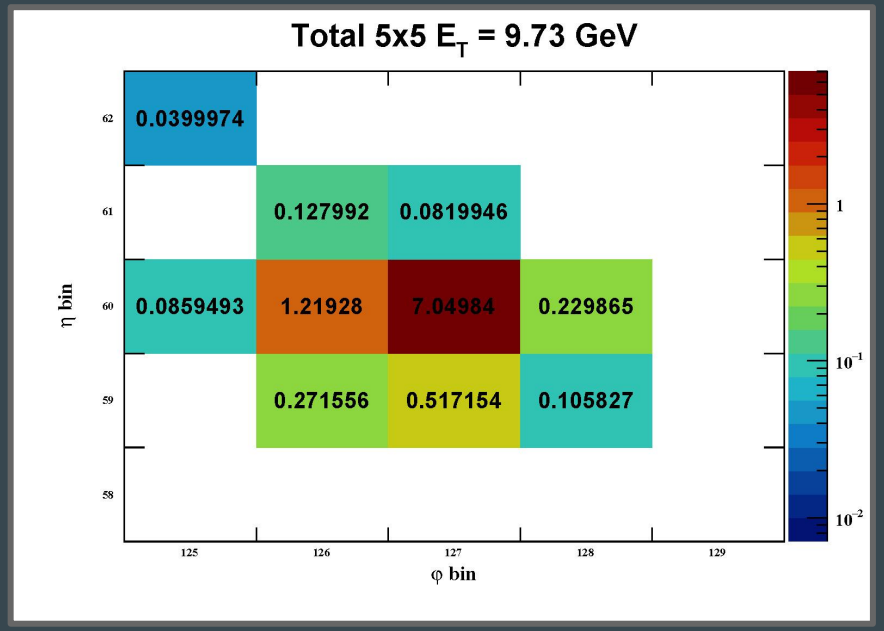
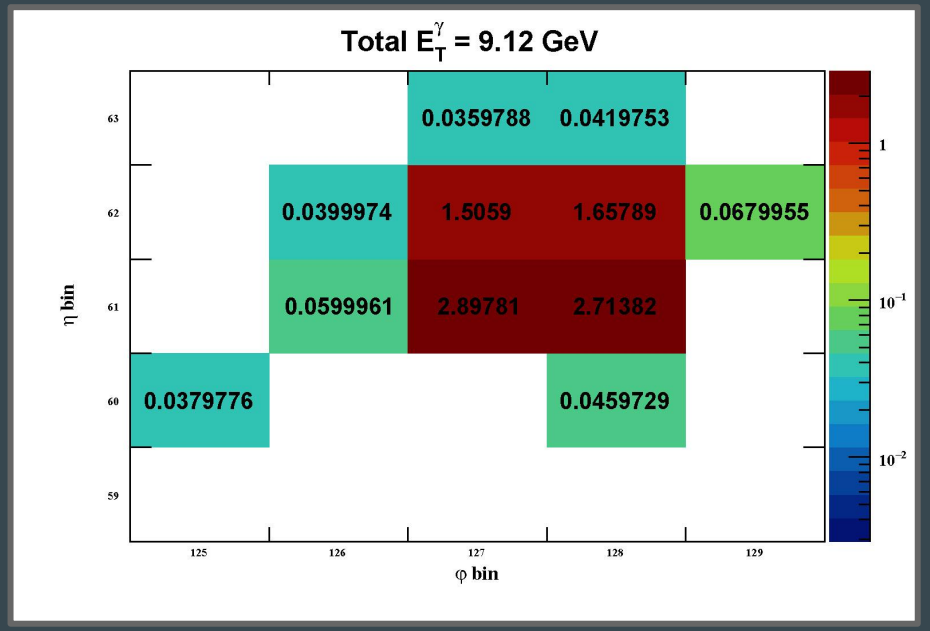
- Varied (but known) particle p_T

Simple Checks: Illustrating Cluster E_T



Electron



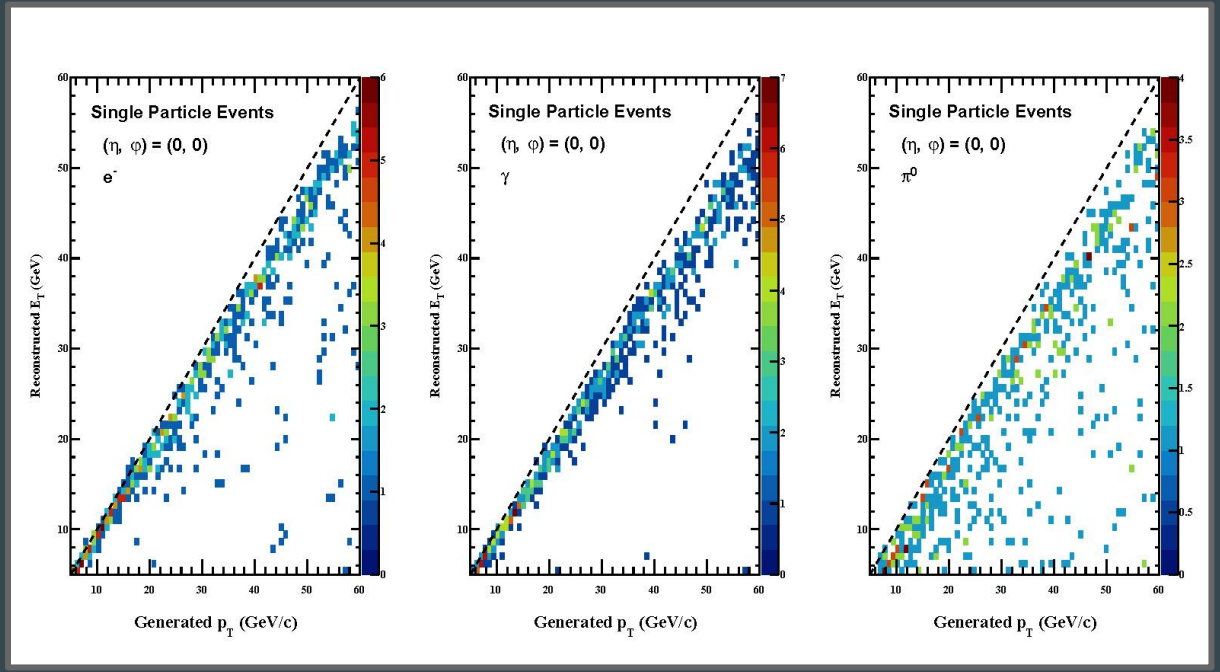
Photon

- Single generated particle with p_T = 10 GeV/c.
- Each box is a tower labeled with its collected E_T
- The sum of 5x5 tower E_T is the cluster E_T

Clustered E_T vs. Generated p_T

For each of e^-, γ, and π^0:

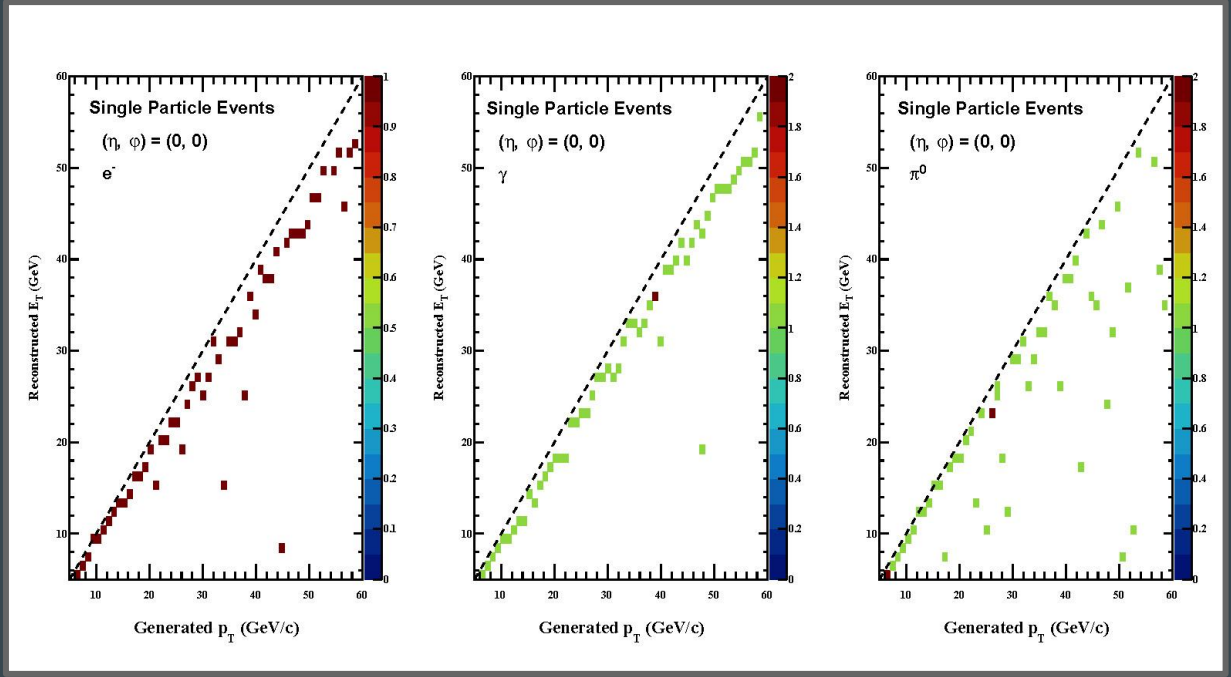
- Generate one single-particle event
  - $(\eta, \varphi) = (0, 0)$
  - known p_T
  - noise included
- Plot the cluster E_T that was found
- Repeat for many (independent) events with different particle p_T



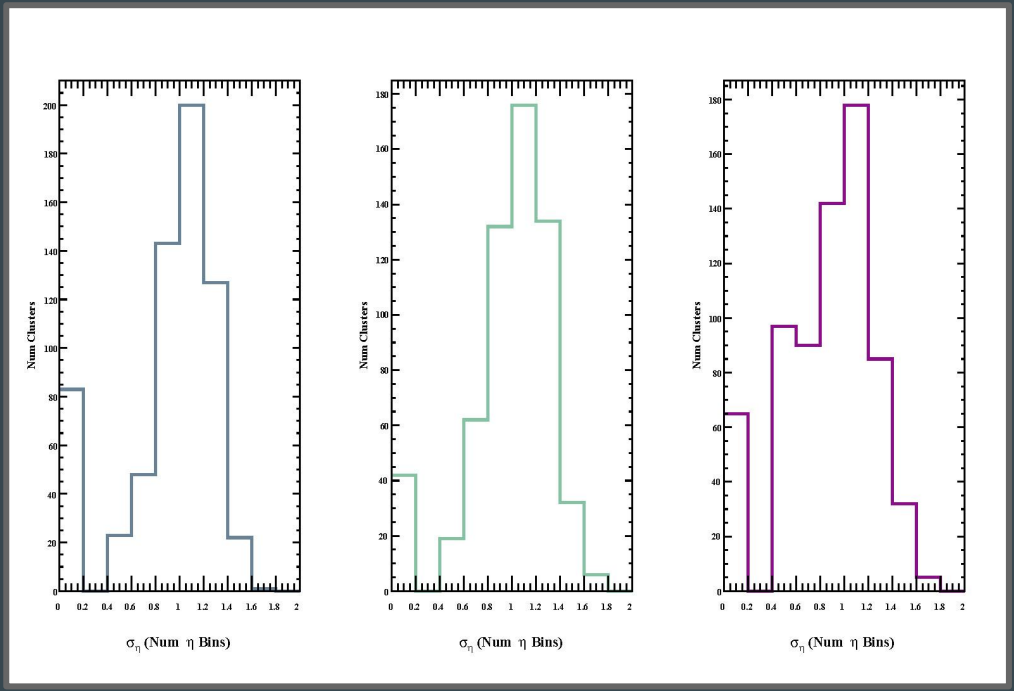
Comparison with Simple 5x5 Clusterizer

For each of e^-, γ, and π^0:

- Collect seed towers.
- Construct simple 5xt5 clusters centered on each seed.
- More data needed for “fair” comparison.



Characterizing Shower Shape with σ_η



Electron Photon Pi0

Work in Progress

- Writing an evaluation module similar to CaloEvaluator.
- Exploring effect of superclustering/Bremsstrahlung recovery on performance.
- Inspecting properties of clusters with reconstructed E_T << generated p_T
- Running with PYTHIA events / more complicated events than PHG4SimpleEventGenerator.